ARIKETAK. LEHENENGO ZATIA (1, 2, 3 . Gaiak).

1) Oinarrizko Zirkuitu digitalak erabiliz, kotxearen segurtasun-uhalerako alarma sistema diseinatu ezazu. Sistemak detektatu behar izango du kotxea martxan jarri dugunean eta segurtasun-uhala jarrita ez dugunean.

2) Oinarrizko zirkuitu digitalak erabiliz, etxearen gelarako arrotz-detektagailu sistema diseinatu ezazu. Horretarako sentsoreak gelako bi leihoetan eta atean izango ditugu. Leihoa edo atea zabaltzen direnean sentsore hauek maila altuko irteera ematen dute

3) Garatu ondorengo adierazpenak,modu kanonikoa lortu arte:

- f1 = $\overline{A}\overline{C} + A\overline{C}D + \overline{A}BCD$
- f2 = $\overline{A}\overline{C}\overline{D} + AC + ABC$
- f3 = $\overline{A}B + AC$
- f4 = $(\overline{B} + \overline{D})(\overline{B} + A)(C + \overline{D})(\overline{D} + A)$
- f5 = $(X_1 + X_3)(X_3 + X_2X_4) + (X_3X_5 + (X_1 + X_4)(X_2 + \overline{X_3}))$

4) Karnaugh-en mapak erabiliz, adierazi eta sinplifika itzazu ondorengo funtzioak.

a) $f_1 = (1,3,9,10,12,13,14,15)_m$
b) $f_2 = (0, 2, 3, 4, 5, 7, 8, 10, 11)_m$
c) $f_3 = (1, 6, 7)_m$
d) $f_4 = (0, 1, 6)_M$
e) $f_5 = (0, 1, 2, 3, 7, 8, 9, 11, 15)_m + K(6, 12)$
f) $f_6 = (3, 6, 7, 8, 10)_m + K(12, 13, 14)$
g) $f_7 = (0, 1, 4, 5, 7, 8, 10, 15)_m + K(2, 6, 14)$
h) $f_8 = (0, 1, 4, 5, 6, 7, 12, 13, 14, 16, 17, 28, 29)_m + K(10, 11, 22, 23, 25, 26, 30, 31)$

5) NAND logika erabiliz osa itzazu ondorengo adierazpenak:

a) $ABC + DE$
b) $ABC + \overline{D} + \overline{E}$
c) ABC
d) $\overline{AB} + \overline{CD}$
e) $(A + B)(C + D)$
f) $AB[C(DE + \overline{AB}) + \overline{BCE}]$
g) $B(CDE + \overline{E}FG)(\overline{AB} + C)$

6) Familia logiko ezberdinen ezaugarririk adierazgarrienak ondorengo taulan agertzen dira. Lor itzazu zarata-tarteak eta fan-out:

	TTL	TTL LS	TTL ALS	CMOS
Vcc	5V	5V	5V	3V-18V
V_{IH}	2.0	2.0	2.0	3.5
V_{IL}	0.8	0.8	0.8	1.5
V_{OH}	2.4	2.7	2.7	4.5
V_{OL}	0.4	0.5	0.4	0.5
I_{IH} µA	40	20	20	0.005
I_{IL} mA	-1.6	-0.36	-0.2	-0.005µA
I_{OH} µA	-400	-400	-400	-360
I_{OL} mA	16	8	4	4

7) Zirkuitu inpreso batetan TTL Standar-arekin egindako txip bat daukagu. Posiblea litzateke Txip horren ordez TTL LS edo TTL AS txip bat jartzea?

8) Bidegurutze batetako semaforoen funtzionamendua, ondorengo baldintzetan datza:

- A kalean kotxe bat baldin badago, orduan kale horretako semaforoa berde dago.
- B kalean kotxe bat baldin badago, orduan kale horretako semaforoa berde egongo da baldin eta A kalean kotxerik ez badaude.
- C kalean kotxe bat baldin badago, orduan kale horretako semaforoa berde egongo da baldin eta A eta B kaleetan kotxerik ez badaude.
- Kotxerik ez badaude, semaforo guztiak gorriz daude.

$S_A = \bar{A}$

$S_B = A\bar{B}$

$S_C = A\bar{C}B$

Egitaula erabiliz, adieraz ezazu antolaketa honi dagokion funtzio logikoa (gorri = 1).

9) Entrepresa baten akzioak ondoren adierazten den moduan banatuta dituzte lau bazkideen artean:

A = 35% B = 30% C = 25% D = 10%

Proposamen bat hautatu nahi denean, botuen arabera aurrera joango den ala ez jakiteko diseinatu ezazu funtzio logikoa. $f = AB + AC + BC$

10) Prozesu kimikoak egiten diren entrepresa batetan, hiru elementu kimiko ezberdin erabiltzen dira. Hiru elementu hauek hiru biltegi ezberdinetan gordetzen dira. Biltegi bakoitzean, elementu bakoitzaren maila adierazteko sensore bat dago. Likidoaren maila, adierazitako puntu baten azpitik dagoenean, sensoreak tentsio altua sortarazten du.

$f = \bar{A}BC + A\bar{B}C + AB$

Biltegi bakoitzean elementu kimiko bakoitzaren maila, monitore batetan ikusgarri izan dadin, diseinatu ezazu zirkuitu bat, zeinak seinale bat emago duen bi biltegien maila, adierazitako puntuaren azpitik agertzen denean.

11) Diseinatu ezazu lau aldagai dituen zirkuitu logiko bat, zeinak 1 sortuko duen irteeran, sarreran hiru aldagai 1 direnean.

12) Igogailu baten funtzionamenduan akatsik dagoen, detektatzen duen sistema diseinatu nahi da, zeinak ondoko baldintzak bete behar dituen:
- Igogailua matxan jartzen denean, atea itxita egon behar da.
- Hutsik badago eta eskaerarik ez badago, ez da mugitu behar.
- Geldirik badago, atea zabalik.

13) Zirkuitu logiko batek, 5 sarbide eta irtenbide 1 du. Bost sarbidetatik, lauk digito hamartar bat adieraten dute eta bostgarrena kontrolerako digitoa da. Kontrol-digito hau 0 logikoan dagoenean, irteera 0 logikoa izango da hamartarra zenbaki bikoitia baldin bada, eta irteera 1 izango da bakoitia baldin bada. Kontrol-digitoa 1 logikoan dagoenean, irteera 0 izango da, sarrera hiruren anizkoitza denean. Diseinatu ezazu zirkuitua.

ARIKETAK. LEHENENGO FASEA (1,2,3. Gaiak) - 001

1) A → segurtasun uhala
B → martxan jarri

A	B	F
0	0	0
0	1	1
1	0	0
1	1	0

~~[illegible]~~

$f = \bar{A}B$

2) A → 1 leihoa
B → 2 leihoa
C → atea

A	B	C	F
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

$f = A + B + C$

4) Karnaughen bidez simplifikatu

a) $f_1 = (1,3,9,10,12,13,14,15)_m$

0001
0011
1001
1010
1100
1101
1110
1111

AB \ CD	00	01	11	10
00		1	1	
01				
11	1	1	1	1
10		1		1

$\bar{A}\bar{B}D + A\bar{C}D + AC\bar{D} + AB$

~~(ABCD + ABCD + ABCD + AB)~~

b) $f_2 = (0,2,3,4,5,7,8,10,11)_m$

0000
0010
0011
0100
0101
0111
1000
1010
1011

AB \ CD	00	01	11	10
00	1		1	1
01	1	1	1	
11				
10	1		1	1

$\bar{B}C + \bar{A}BD + \bar{A}\bar{C}\bar{D} + \bar{B}\bar{C}\bar{D}$

c) $f_3 = (1,6,7)_m$

001
110
111

AB \ C	0	1
00		1
01		
11	1	1
10		

$AB + \bar{A}\bar{B}C$

3) f_1 = 0000 1001 1011 1111
0001 1101
0100
0101

$\bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}D + \bar{A}B\bar{C}\bar{D} + \bar{A}B\bar{C}D + AB\bar{C}D + AB\bar{C}\bar{D} + \bar{A}BCD$

f_2 = 0000 1010 1110
0100 1011 1111
1110
1111

$\bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}B\bar{C}\bar{D} + A\bar{B}C\bar{D} + A\bar{B}CD + ABC\bar{D} + ABCD$

f_3 = 0000 1010 1011
0001 1101 1111
0010 1110
0011 1111

$A\bar{B}\bar{C} + \bar{A}BC + A\bar{B}C + ABC$

f_4 = 0100 0000 0001 0111 $\Pi(1,3,4,5,6,7,9,13,14)$
0110 0010 0101 0011
1101 0111 1001
1111 0111 1111

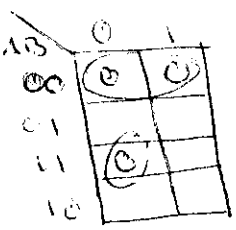
$(A+\bar{B}+C+\bar{D})(A+\bar{B}+\bar{C}+\bar{D})(\bar{A}+\bar{B}+C+\bar{D})(\bar{A}+B+\bar{C}+\bar{D})(A+\bar{B}+C+D)$ ~~$(A+\bar{B}+\bar{C}+\bar{D})$~~ $(A+\bar{B}+\bar{C}+D)$ ·
$\cdot(\bar{A}+B+C+\bar{D})(\bar{A}+B+C+\bar{D})(\bar{A}+B+\bar{C}+\bar{D})$

$f_5 = \overline{\bar{x}_3 \cdot \overline{x_2 x_4}}\ \bar{x}_3\ (\bar{x}_2 + \bar{x}_4)$

---

4) $f_4 = (0,1,6)M$

000
001
110



$A\bar{B} + \bar{A}\bar{B}C$

$(A+B)(\bar{A}+\bar{B}+C)$

9) A-35% B-30% C-25% D-10%

A	B	C	D	F	
0	0	0	0	0	
0	0	0	1	0	
0	0	1	0	0	
0	0	1	1	0	
0	1	0	0	0	
0	1	0	1	0	
0	1	1	0	1	
0	1	1	1	1	
1	0	0	0	0	
1	0	0	1	0	
1	0	1	0	1	
1	0	1	1	1	
1	1	0	0	1	
1	1	0	1	1	
1	1	1	0	1	
1	1	1	1	1	

$\Sigma(6,7,10,11,12,13,14,15)$

$\bar{A}BC\bar{D} + \bar{A}BCD + A\bar{B}C\bar{D} + A\bar{B}CD + AB\bar{C}\bar{D} + AB\bar{C}D + ABC\bar{D} + ABCD$

$\bar{A}BC(\bar{D}+D) + A\bar{B}C(\bar{D}+D) + AB\bar{C}(\bar{D}+D) + ABC(\bar{D}+D)$

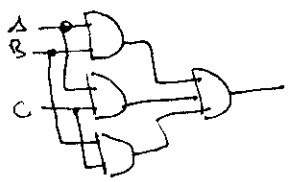
$\bar{A}BC + A\bar{B}C + AB\bar{C} + ABC$

$\bar{A}BC + A\bar{B}C + AB$

$B(A+\bar{A}C) + AB\bar{C}$

$BA + BC + A\bar{B}C$

$A(B+\bar{B}C)$ $AB + AC + BC$



ARIKETAK. LEHENENGO MAILA (1, 2, 3. Gaiak) - 002

3) A → Kotxea → barde
   ez → gorri

B → [redacted] kotxe • A gorri → barde

C → kotxe • A gorri • B kotxea ez

gorri = 1
barde = 0

A	B	C	F
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	
1	0	1	
1	1	0	
1	1	1	

A → Kotxe → barde

B → kotxe
A kotxea ez → barde

C → kotxe
A kotxea ez → barde
B kotxea ez

Kotxerik ez → gorri

0 → kotxe ez
1 → kotxebai

A	B	C	S_A	S_B	S_C
0	0	0	1	1	1
0	0	1	1	1	0
0	1	0	1	0	0
0	1	1	1	0	1
1	0	0	0	1	1
1	0	1	0	1	1
1	1	0	0	1	1
1	1	1	0	1	1

$S_A = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}BC + A\bar{B}\bar{C}$

$S_B = \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + A\bar{B}\bar{C} + A\bar{B}C + AB\bar{C} + ABC$

$S_C = \bar{A}\bar{B}C + \bar{A}B\bar{C} + \bar{A}BC + A\bar{B}\bar{C} + A\bar{B}C + AB\bar{C} + ABC$

1) Bi segurtasun uhelekin.

A	B	C (atzera)	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	0

$\bar{A}\bar{B}C + \bar{A}BC + A\bar{B}C$

$\bar{A}(\bar{B}C + BC) + AC(\bar{B}+B)$

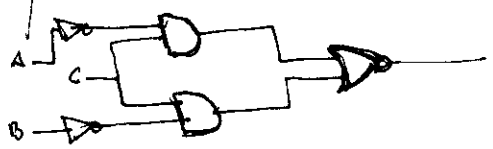
$\bar{A}C(\bar{B}+B) + AC$

$C(\bar{A}+A) \rightarrow f = C$

$\bar{A}[C(\bar{B}+B)] + A\bar{B}C$

$\bar{A}C + A\bar{B}C$

$C(\bar{A} + A\bar{B})$ $\boxed{C\bar{A} + C\bar{B}}$



8) $\bar{A}\bar{B}(\bar{C}+C) + \bar{A}[B(\bar{C}+C)]$

$\bar{A}(\bar{B}+B) \rightarrow \boxed{f = \bar{A}}$ S_A

$\bar{A}\bar{B}(C+\bar{C}) + A[\bar{B}(\bar{C}+C)] + AB(C+\bar{C})$

$\bar{A}\bar{B} + A\bar{B} + AB \quad \bar{A}\bar{B} + A \quad \boxed{f = A + \bar{B}}$ S_B

$\bar{A}\bar{C}(\bar{B}+B) + A(\bar{B}C + B\bar{C}) + AB(\bar{C}+C)$

$\bar{A}\bar{C} + AC + AB$

$\bar{A}\bar{C}(\bar{B}+B) + BC(\bar{A}+A) + A\bar{C}(B+\bar{B}) + AB\bar{C}$

$\bar{A}\bar{C} + BC + A\bar{C} + AB\bar{C}$

$C(B + A\bar{B}) \rightarrow CB + CA$

$\bar{A}\bar{C} + A\bar{C} + AC + BC$

$\bar{A}\bar{C} + A(C+\bar{C}) + BC$

$A + \bar{C} + BC$ $\boxed{f = A + \bar{C} + B}$ S_C

10) A → bacava → 1

B → bacava → 1

C → bacava → 1

A	B	C	F
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

$f = \bar{A}BC + A\bar{B}C + AB\bar{C} + ABC$

$\bar{A}BC + A\bar{B}C + AB(\bar{C} + C)$

$f = AB + AC + BC$

11)

A	B	C	D	F
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

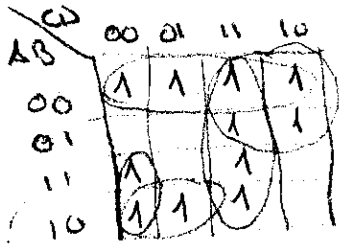
$\bar{A}BCD + A\bar{B}CD + AB\bar{C}D + ABC\bar{D} + ABCD$

$f = BCD + ACD + ABD + ABC$

12) niertaen · arteenitaita
hutsik · eskaeranik en → seldi

4. e) $f_5 = (0,1,2,3,7,8,9,11,15)_m + \varepsilon(6,12)$

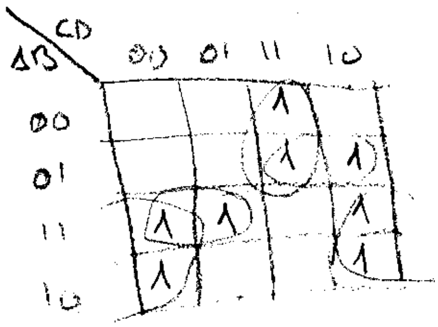
0000
0001
0010
0011
0111
1000
1001
1011
1111
0110
1100



$\bar{A}\bar{B} + CD + \bar{A}C + A\bar{C}\bar{D} + A\bar{B}\bar{C}$

f) $f_6 = (3,6,7,8,10)_m + \varepsilon(12,13,14)$

0011
0110
0111
1000
1010
1100
1101
1110



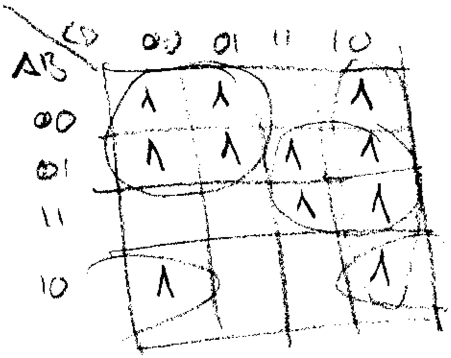
$\bar{A}CD + \bar{A}BC + A\bar{D} + AB\bar{C}$

$\bar{B}C + AB\bar{C}$

ARIKETAK [illegible]

4) a) $f_1 = (0,1,4,5,7,8,10,15)_m + k(2,6,14)$

0000
0001
0100
0101
0111
1000
1010
1111
0010
0110
1110

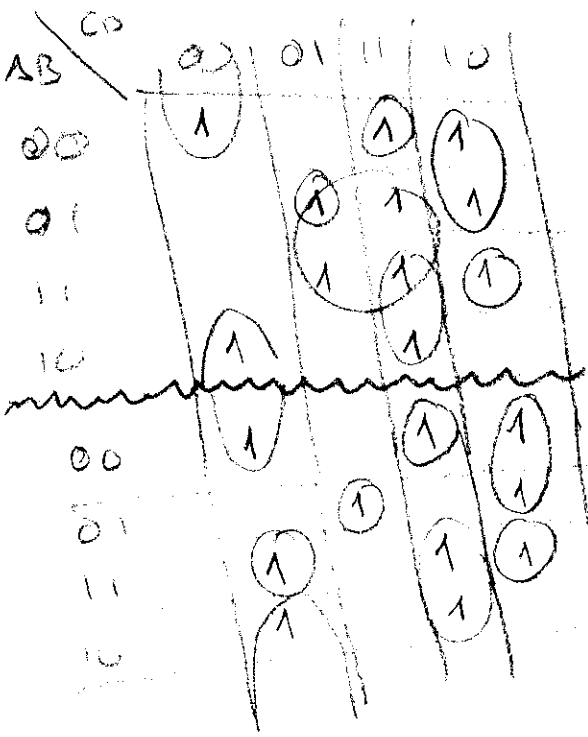


$\bar{A}\bar{C} + BC + C\bar{D} + A\bar{B}\bar{D}$

b) $f_2 = (0,1,4,5,6,7,12,13,14,16,17,28,29)_m + k(10,11,22,23,25,26,30,31)$

~~2, 3, 8, 9, 10, 11, 15, 18, 19, 20, 21, 22, 23~~

0	00000	01010	10
1	00001	01011	11
4	00100	10110	22
5	00101	10111	23
6	00110	11001	25
7	00111	11010	26
12	01100	11110	30
13	01101	11111	31
14	01110		
16	10000		
17	10001		
28	11100		
29	11101		



E = 0

E = 1

~~$\bar{B}\bar{C}\bar{D} + AB\bar{C}\bar{D}E + \bar{A}C\bar{D} + \bar{A}\bar{B}\bar{C}D +$~~
~~$+ \bar{A}C\bar{D} + AB\bar{C}\bar{D} + \bar{A}\bar{B}CD$~~ $+ BD\bar{E}$

$\bar{A}C\bar{D} + ACD + ABC\bar{D} + \bar{A}\bar{B}CD + \bar{A}\bar{B}\bar{C}D + AB\bar{C}\bar{D}E + \bar{B}\bar{C}\bar{D} + BD\bar{E}$

12) Martxan baldin badago
hutsik eta eskaeraik ez → geldi
geldi → atea irekita

A → martxan = 1
B → atea zabalik = 1
C → hutsik = 0
D → eskaera = 1

akatsa = 1

A	B	C	D	F
0	0	0	0	
0	0	0	1	
0	0	1	0	
0	0	1	1	
0	1	0	0	
0	1	0	1	
0	1	1	0	
0	1	1	1	
1	0	0	0	
1	0	0	1	
1				

12) A → mertxe = 1

B → atea zabaltik = 1

C → hutsik = 0

D → elaera = 1

A	B	C	D	F
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

1 → ekatse

0 → ekatsiker

AB \ CD	00	01	11	10
00				
01	0	0	0	0
11				
10		0	0	0

AB \ CD	00	01	11	10
00	1	1	1	1
01				
11	1	1	1	1
10	1			

$\bar{A}\bar{B} + AB + A\bar{C}\bar{D}$

$(A+\bar{B})(\bar{A}+B+\bar{D})(\bar{A}+B+\bar{C})$ ekatsiker

13) A B C D E F

A B C D: digito hamartarra

E: kontrol digitoa

Kontrola = 0, hamartarra = bikoitia } orduan F = 0

Kontrola = 0, hamartarra = bakoitia } orduan F = 1

Kontrola = 1 } orduan F = 0, sarrera = 3.7

A B C D	F (E=0)	F (E=1)
0000	X	X
0001	1	X
0010	0	X
0011	1	0
0100	0	X
0101	1	X
0110	0	0
0111	1	X
1000	0	X
1001	1	0
1010	0	X
1011	1	X
1100	0	0
1101	1	X
1110	0	X
1111	1	0

E=0

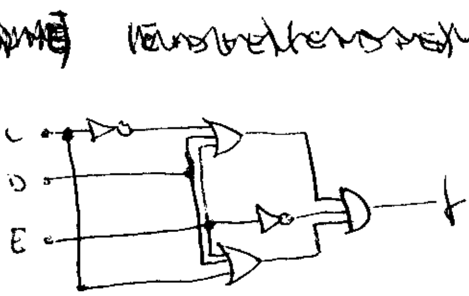
AB \ CD	00	01	11	10
00	X	1	1	0
01	0	1	1	0
11	0	1	1	0
10	0	1	1	0

E=1

AB \ CD	00	01	11	10
00	X	X	0	X
01	X	X	X	0
11	0	X	0	X
10	X	0	X	X

$F = D\bar{E}\,[\bar{B}\bar{D} + \bar{A}\bar{C} + A\bar{B}\bar{C} + B\bar{C}D + AB\bar{C} + \bar{A}BD]$

F = [illegible] DĒ



ARIKETAK. LEHENENGO ZATIA (1, 2, 3. Gaiak) - 004

6) Zerata. kasketa

$V_{NH} = V_{OH\,min} - V_{IH\,min}$

$V_{NL} = V_{IL\,max} - V_{OL\,max}$

TTL $V_{NH} = 0'4V$ fan-out = 10 ate

$V_{NL} = 0'4V$

TTL LS $V_{NH} = 0'7V$ fan-out = 20 ate

$V_{NL} = 0'3V$

TTL ALS $V_{NH} = 0'7V$ fan-out = 20 ate

$V_{NL} = 0'4V$

CMOS $V_{NH} = 1V$ fan-out = 72k ate

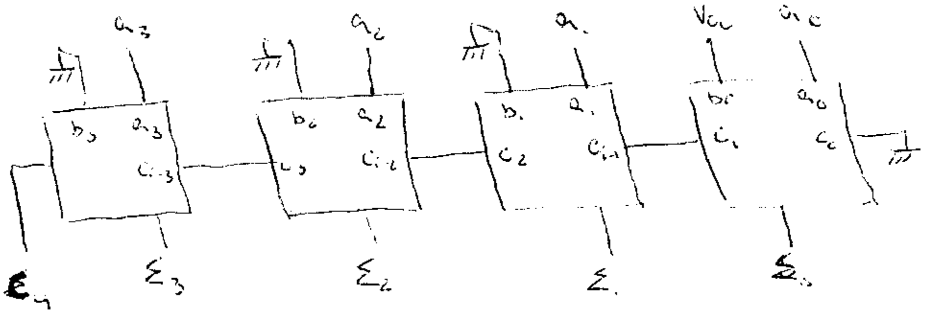
$V_{NL} = 1V$

7) TTL estandarraren ordez TTL LS edo TTL AS?

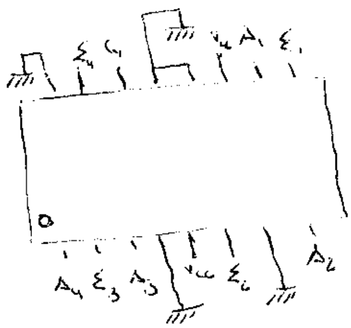
Bai Seinale naulak berdinak dira bien kasuetan

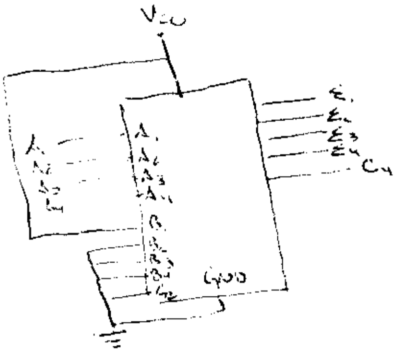
ARIKETAK. BIGARREN FASEA (14. Gaia) -001

14)



7483 integratua erabiliz





15) A-B kenketa

2ko osagarrian

A-B<0 → emaitza negatiboa

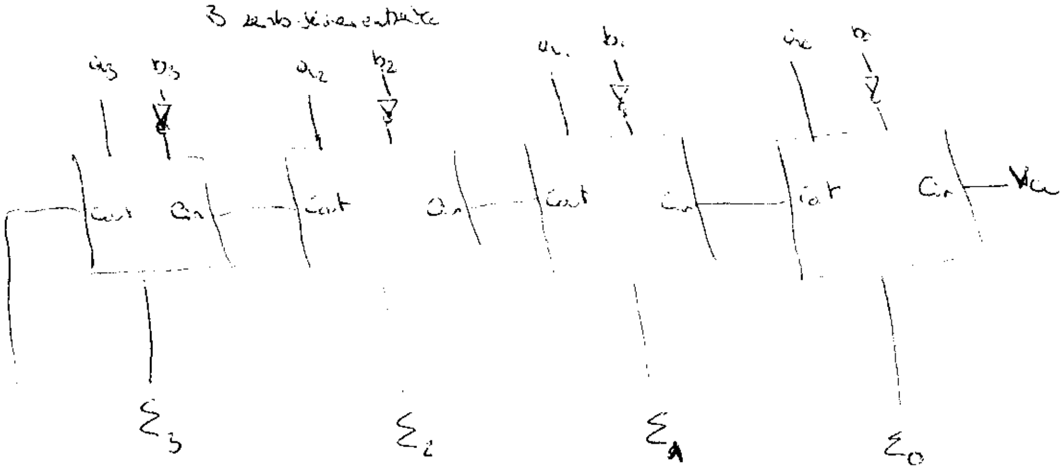
→ led bat piztu

2ko osag.

$A - B = A + (\overline{B} + 1)$

4 digitu → 1 zeinuarentzat

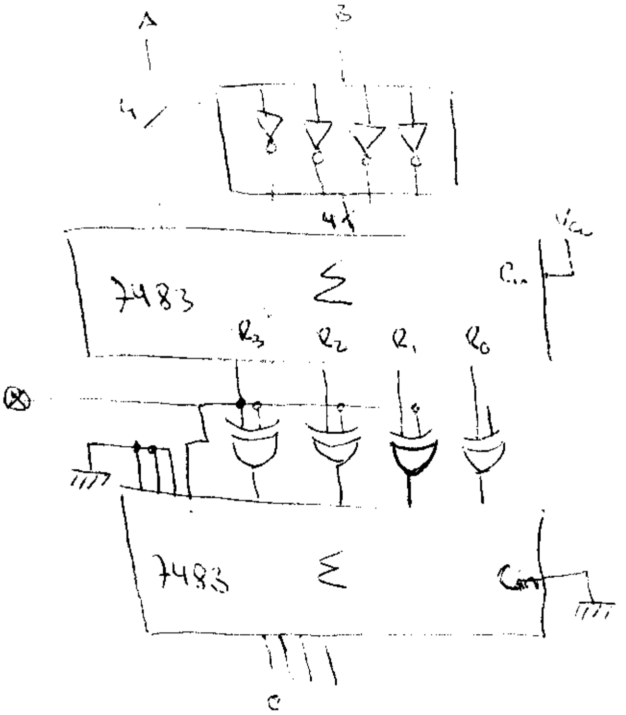
3 zenbakiarentzat



Σ_3 → 0 positiboa

→ 1 negatiboa

$\Sigma_3 = 1$, negatiboa denean, 2ko osagarrian egongo da. Desegin beharko dugu.

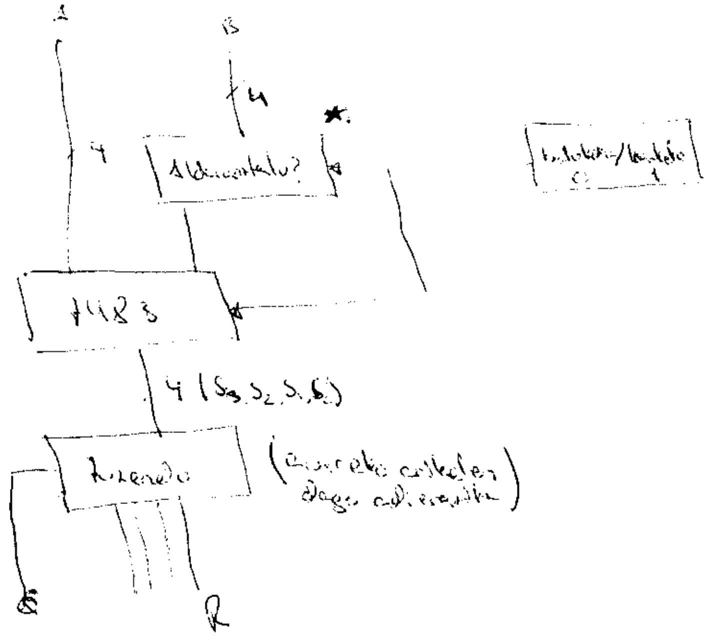


R_3	R_i	[illegible]	[illegible]
0	0	0 [illegible]	
0		1 [illegible]	
1	0	1 [illegible]	
1	1	0 [illegible]	

16) $A, B \geq 0$ [illegible] a_3, b_3 [illegible]

$A, B \in [-8, 7]$

4 bit [illegible], overflow [illegible] ([illegible] 7+3 [illegible])



★ $b_i \oplus [\bar{S}/R]$

b_i	$\bar{S}/R$	
0	0	0
0	1	1
1	0	1
1	1	0

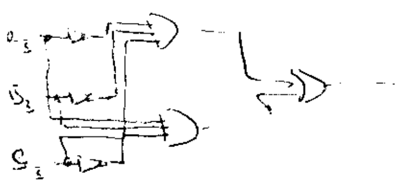
$S = 0$ [illegible]
$S = 1$ [illegible]

Overflow [illegible]

→ [illegible]

a_3	b_3	S_3	Overflow	
0	0	0	0	
0	0	1	1	[illegible]
0	1	0	0	
0	1	1	0	
1	0	0	0	
1	0	1	0	
1	1	0	1	[illegible]
1	1	1	0	

$OV: \bar{a}_3 \bar{b}_3 S_3 + a_3 b_3 \bar{S}_3$



ARIKETAK BIGARREN ZATIA (4. gaia). - 002

17) n biteko kenketa

$a_n \; a_{n-1} \; a_{n-2} \; \dots \; a_i \; \dots \; a_3 \; a_2 \; a_1$

1 1 0 1

	a_n	a_{n-1}	a_{n-2}	… a_i …	a_3	a_2	a_1	
0	0	0	… 0 …	0	0	0		
a_n	a_{n-1}	a_{n-2}	a_{n-3}	a_{n-4} …	a_{i-2} …	a_1		

$R_{n+3} \; R_{n+2} \; R_{n+1} \; R_n \; R_{n-1} \; R_{n-2} \; \dots \; R_i \dots R_3 \; R_2 \; R_1$

$R_1 = a_1$

$R_2 = a_2$

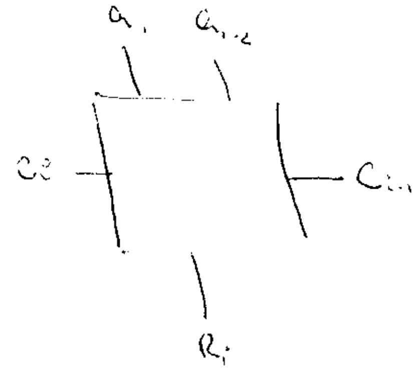
$R_3 = a_3 + a_1$

$R_i = a_i + a_{i-2} + C_{i-1}$

$R_n = a_n + a_{n-2} + C_{n-1}$

$R_{n+1} = a_{n-1} + C_n$

$R_{n+2} = a_n + C_{n+1}$



a_i	a_{i-2}	C_{i-1}	C_i	R_i
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

1 kopuru bakoitza den guztietan $R_i = 1$ dago

$$R_i = a_i \oplus a_{i-2} \oplus C_{i-1}$$

$C_i = \overline{a_i} a_{i-2} C_{i-1} + a_i \overline{a_{i-2}} C_{i-1} + a_i a_{i-2} \overline{C_{i-1}} + a_i a_{i-2} C_{i-1}$

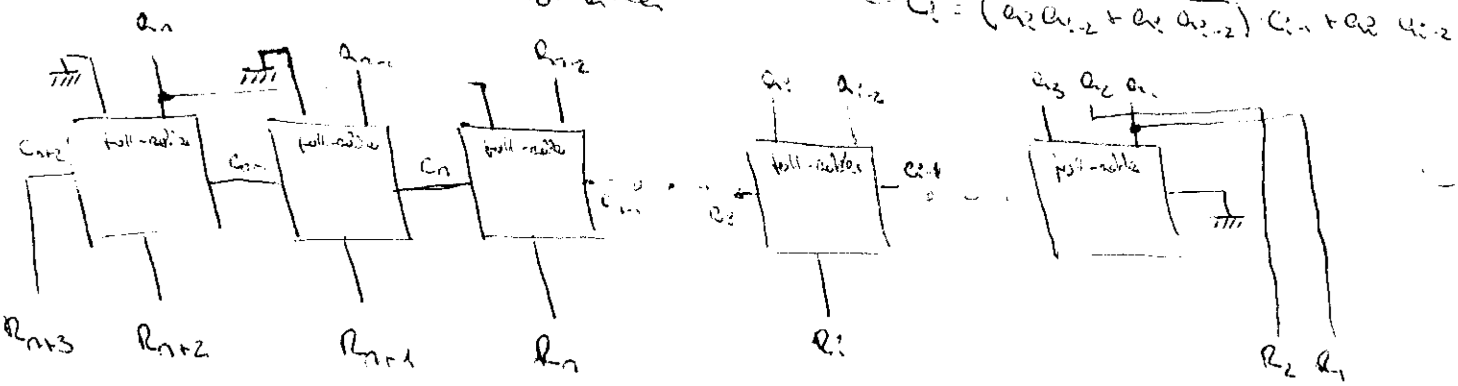
$C_i = \overline{a_i} a_{i-2} C_{i-1} + a_i \overline{a_{i-2}} C_{i-1} + a_i a_{i-2}$

$C_i = (\overline{a_i} a_{i-2} + a_i \overline{a_{i-2}}) C_{i-1} + a_i a_{i-2}$

0	0	0
0	1	1
1	0	1
1	1	0

Xor atea

$C_i = (a_i \oplus a_{i-2}) C_{i-1} + a_i a_{i-2}$



18)

$a_1 \; a_0$

$\times \; b_1 \; b_0$

$a_1 b_0 \; a_0 b_0$

$a_1 b_1 \; a_0 b_1$

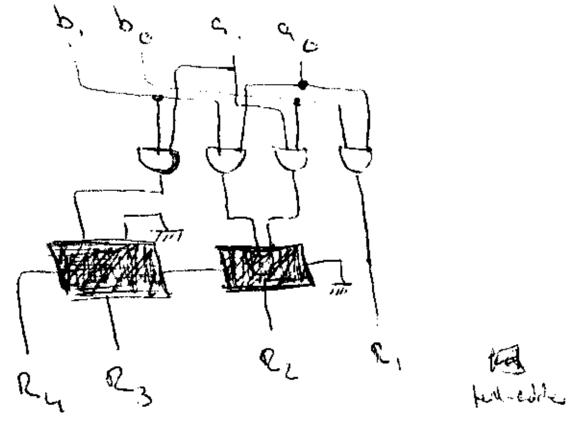
$R_4 \; R_3 \; R_2 \; R_1$

$R_1 = a_0 b_0$

$R_2 = a_1 b_0 + a_0 b_1$

$R_3 = a_1 b_1 + C_{R_2}$

$R_4 = C_{R_3}$



a_5 a_4 a_3 a_2 a_1 a_0

b_5 b_4 b_3 b_2 b_1 b_0

---

a_5b_0 a_4b_0 a_3b_0 a_2b_0 a_1b_0 a_0b_0

a_5b_1 a_4b_1 a_3b_1 a_2b_1 a_1b_1 a_0b_1

a_5b_2 a_4b_2 a_3b_2 a_2b_2 a_1b_2 a_0b_2

a_5b_3 a_4b_3 a_3b_3 a_2b_3 a_1b_3 a_0b_3

R_8 R_7 R_6 R_5 R_4 R_3 R_2 R_1 R_0

$R_0 = a_0b_0$

$R_1 = a_1b_0 + a_0b_1$

$R_2 = a_2b_0 + a_1b_1 + a_0b_2 + C_{R1}$

$R_3 = a_3b_0 + a_2b_1 + a_1b_2 + a_0b_3 + C_{R2}$

$R_4 = a_4b_0 + a_3b_1 + a_2b_2 + a_1b_3 + a_0b_4 + C_{R3}$

$R_5 = a_5b_0 + a_4b_1 + a_3b_2 + a_2b_3 + a_1b_4 + a_0b_5 + C_{R4}$

$R_6 = a_5b_1 + a_4b_2 + a_3b_3 + a_2b_4 + a_1b_5 + C_{R5}$

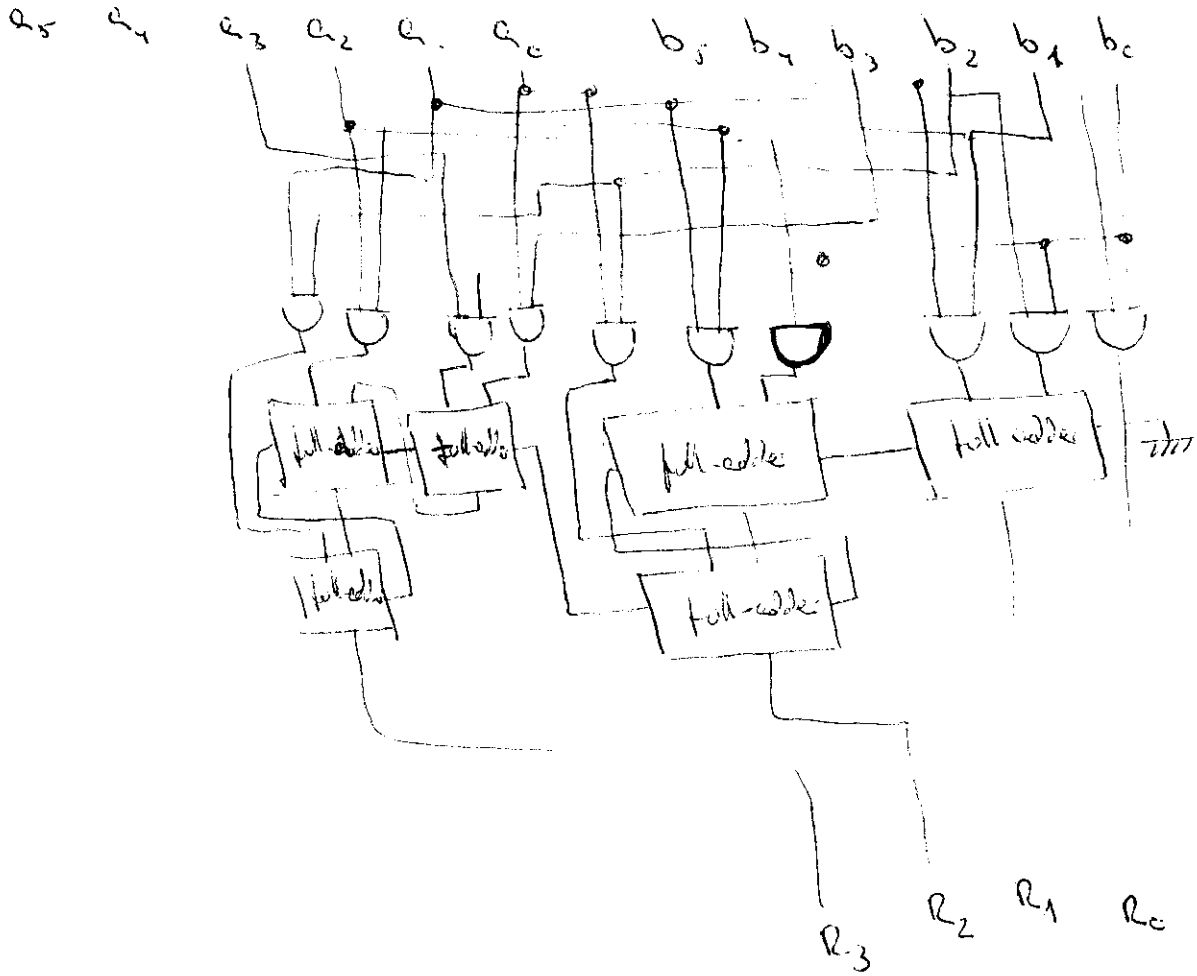
$R_7 = a_5b_2 + a_4b_3 + a_3b_4 + a_2b_5 + C_{R6}$

$R_8 = a_5b_3 + a_4b_4 + a_3b_5 + C_{R7}$

$R_9 = a_5b_4 + a_4b_5 + C_{R8}$

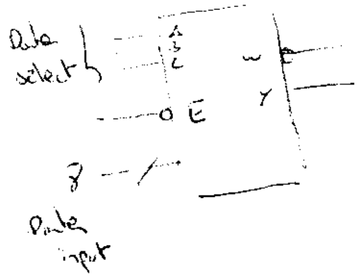
$R_{10} = a_5b_5 + C_{R9}$

C_{R10}



ARKETAL BİLGİSAYAR KATIA (1. Çözüm) 2003

25) 74151 ile → $f = \Sigma m(0,2,3,5)$



$Y = D_0 \bar{A}\bar{B}\bar{C} + D_1 \bar{A}\bar{B}C + D_2 \bar{A}B\bar{C} + D_3 \bar{A}BC + D_4 A\bar{B}\bar{C} + D_5 A\bar{B}C + D_6 AB\bar{C} + D_7 ABC$

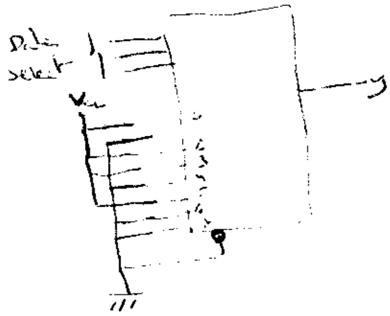
$f = \Sigma m(0,2,3,5) = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}BC + A\bar{B}C$

$D_0 = 1$ $D_1 = 0$

$D_2 = 1$ $D_4 = 0$

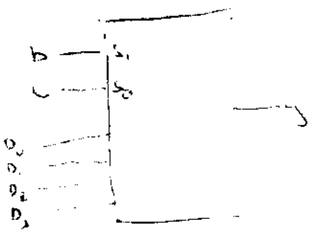
$D_3 = 1$ $D_6 = 0$

$D_5 = 1$ $D_7 = 0$



26) 4 lük seçici MUX ile $f = ab + \bar{b}c$

$s_1 \; b \quad s_0 \; b$



$Y = D_0 \bar{S_1}\bar{S_0} + D_1 \bar{S_1} S_0 + D_2 S_1 \bar{S_0} + D_3 S_1 S_0$

$f = ab + \bar{b}c$

$ab(c+\bar{c})$ $\quad D_1 = 1$

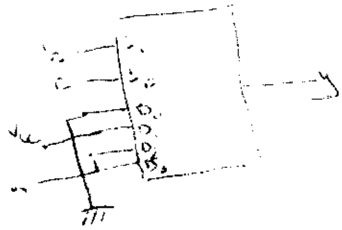
$f = abc + ab\bar{c} + \bar{b}c$

$D_3 \quad D_2$

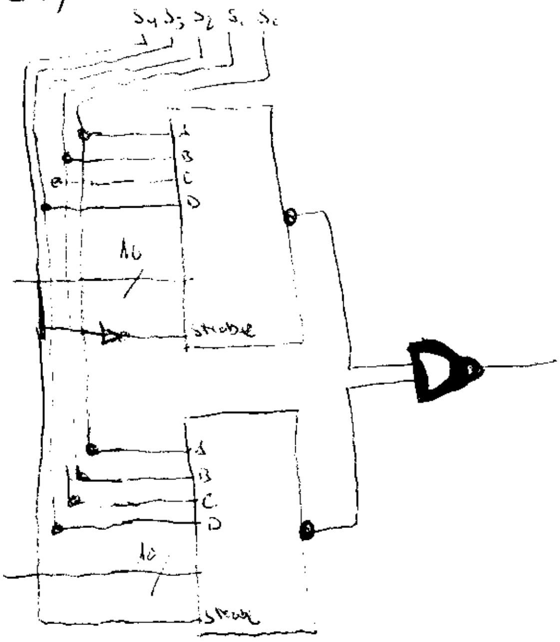
$D_3 = a$

$D_2 = a$

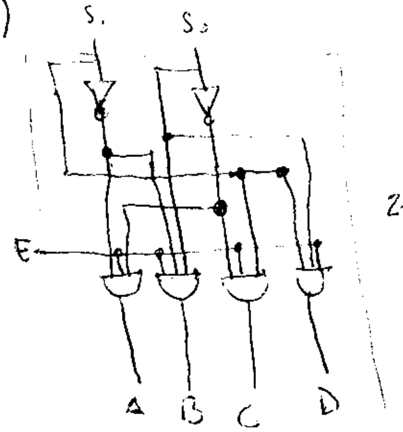
$D_1 = 1$



24)

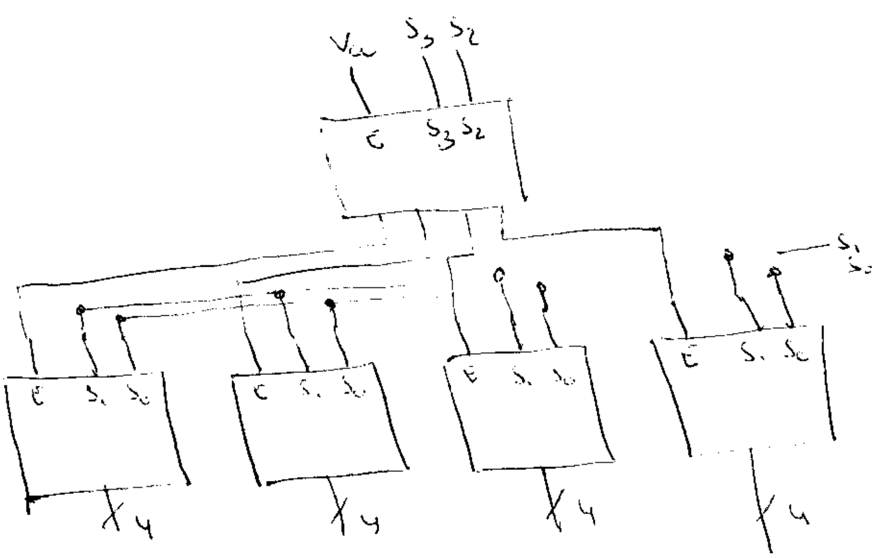


23)



2-to-4-ts

0 0	A	$\bar{S_1} \cdot \bar{S_0}$
0 1	B	$\bar{S_1} \cdot S_0$
1 0	C	$S_1 \cdot \bar{S_0}$
1 1	D	$S_1 \cdot S_0$



1 2-4

2 2-4

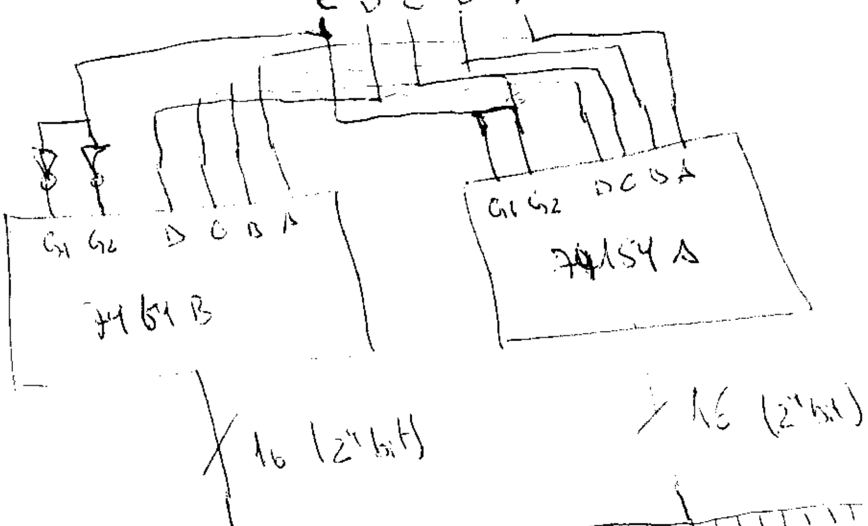
3 2-4

4 2-4

22)

1 0 1 1 0

E D C B A



74154B benzer ...

6 ...

1111111111011111

1111111111111111

$\overline{X_4}\,\overline{X_3}\,\overline{X_1}$ →

30) $\overline{X_4} X_3 X_1 \,(\overline{\bar{C}\bar{B}X_3 \cdot \bar{C}B\overline{X_3} \cdot C\bar{B}\overline{X_3}})$

$\overline{X_4} X_3 \overline{X_1} \,(\overline{\bar{C}B X_3 \cdot CBX_3})$

$\overline{X_4} X_3 X_1 \,(\overline{\bar{C}\bar{B}X_3 \cdot \bar{C}B\overline{X_3} \cdot C\bar{B}X_3})$

$X_4 \overline{X_3}\,\overline{X_1} \,(\overline{C\bar{B}X_3 \cdot CBX_3})$

$X_4 \overline{X_3} X_1 \,(\overline{\bar{C}\bar{B}X_3 \cdot \bar{C}B\overline{X_3} \cdot C\bar{B}X_3})$

~~$X_4 X_3 \overline{X_1}$~~

~~$X_4 X_3 X_1$~~

C: $\overline{X_2} X_0$

$\overline{\overline{X_4}X_3X_1 + \overline{X_4}\,\overline{X_3}X_1 + \overline{X_4}X_3\overline{X_1} + \overline{X_4}X_3X_1 + X_4\overline{X_3}\,\overline{X_1} + X_4\overline{X_3}X_1}$

000 001 010 011 100 101